REMARKS

Claims 40-49 are currently pending in this application. By way of this Reply, claim 49 has been amended. Applicants respectfully submit that no new matter has been introduced into the application by this amendment. A set of annotated claims has been attached hereto as Appendix A in order to clarify the subject matter which the Applicants regard as the invention.

Allowable Subject Matter

The Examiner is thanked for indication that claims 40 and 41 are allowable.

Claim Rejections - 35 U.S.C. §112

Claims 42-49 have been rejected under 35 U.S.C. §112, first paragraph, for failing to comply with the written description requirement. Specifically, page 2 of the Office Action states that dependent claims 42-29 add additional embodiments to the embodiment of independent claim 40, and thus, such combinations require support in the specification.

Applicants respectfully submit that independent claim 40 recites the generic features of a "means for generating a pulse output" and "means for controlling the current...in accordance with an integration output held in the integration means...is stopped by the stopping means" which are commonly shown in Figs. 1, 3, 6, 8 and 10-12. The subject matter of claims 42-49 is also disclosed in these figures. In order to more clearly convey the generic invention underlying each of these dependent claims, an annotated claim index has been provided.

The Action indicates that claim 42 appears to be drawn to the embodiment of Fig. 2. To the contrary, claim 42 is drawn to the embodiment of Fig. 3 which, as can be seen in Fig. 2, comprises a substantially similar arrangement to Fig. 1 (i.e. independent claim 40). As described in paragraphs [0062] and [0063], the embodiment shown in Fig. 3 simply defines the generic pulse output generating means 23, 24 as comparator 31 having hysteresis characteristics. Thus, Applicants respectfully submit that Fig. 3 and the indicated portion of the specification are more than sufficient to cover the embodiment of claim 42.

Claims 43 and 48 are drawn to the embodiment of Fig. 8, rather than Fig. 9 as recited in the Action. With respect to Fig. 8 and its accompanying description in paragraphs [0105] - [0107], a similar arrangement to that disclosed in independent claim 40 is shown, with the additional limitation that the generic pulse output generating means 23, 24 comprises an operational amplifier 61. Thus, Applicants submit that embodiments covered by claims 43 and 48 are sufficiently described as a further adaptation of the generic embodiment recited in independent claim 40 and shown in Fig. 1.

Claims 44-47 and 49 are drawn to the embodiments of Figs. 6 and 10-12, rather than 4, 6 and 9-15 as recited in the Action. Specifically, claim 44 is drawn to the embodiment of Fig. 6, and more distinctly defines the generic power supply 11, the switching unit SW1, the choke coil L, and the reverse voltage source 14 as recited in claim 40. *See* paragraphs [0087] – [0090].

Claim 45 is directed to the embodiment of Fig. 10, which is described in paragraphs [0114]-[0116]. Specifically, Fig. 10 discloses the arrangement of claim 44, and further defines the generic pulse output generating means 23, 24 (as recited in claim 40) as a sample hold circuit 63.

Claim 46 and 47 are disclosed in Fig. 6. As indicated in paragraph [0087], Fig. 6 includes similar portions to that which is described with reference to Figs. 1 and 4, and further defines a current detection circuit 42, the means 51, 53 for stopping the pulse output, and the oscillating circuit 52. Finally, claim 49 is disclosed in Figs. 11-12, which comprise portions of Fig. 10, and further defines the divisional circuit 62 and the sample hold circuit 63 as a microcomputer 71.

Accordingly, Applicants respectfully submit that each of the embodiments recited in dependent claims 42-49 comprise variations of the generic invention disclosed in independent claim 40, and are supported by their corresponding descriptions throughout the specification. Thus, withdrawal of the §112 rejection of the claims is respectfully requested.

If the Examiner believes that any additional matters need to be addressed in order to place this application in condition for allowance, the Examiner is invited to contact the undersigned by telephone at the Examiner's convenience.

In view of the foregoing amendments and remarks, Applicants respectfully submit that the present application, including claims 40-49, is in condition for allowance and a notice to that effect is respectfully requested.

Respectfully submitted,
Noboru KURIYAMA et al.

By /Ryan W. O'Donnell/
Ryan W. O'Donnell
Registration No. 53,401

Volpe and Koenig, P.C.
United Plaza, Suite 1600
30 South 17th Street
Philadelphia, PA 19103
Telephone: (215) 568-6400

RWO/JLJ/djw
Enclosure

APPENDIX A

Annotated Pending Claims

40. A sputtering power supply unit comprising:

a sputtering DC power source (11) for supplying DC power to a sputtering apparatus (18, 19);

a switching unit (SW1) connected across terminals of the sputtering DC power source (11);

at least one choke coil (L) serially connected between the switching unit (SW1) and the sputtering apparatus (18, 19);

a current detection unit (17) for detecting a current supplied to the sputtering apparatus (18, 19) from the sputtering DC power source (11) via the choke coil (L);

a voltage detection unit (16) for detecting a voltage across power source terminals of the sputtering apparatus (18, 19);

a controller (10) outputting a switching signal (SW2) when a voltage corresponding to an arc discharge generated inside the sputtering apparatus (18, 19) is detected by the voltage detection unit (16);

a first switch (SW2) which is closed by the switching signal (SW2);

a reverse voltage source (14) for supplying via the first switch (SW2) a reverse voltage across the power source terminals of the sputtering apparatus (18, 19) for stopping the arc discharge;

means (21) for calculating an instantaneous power supplied to the sputtering apparatus (18, 19) from the voltage detected by the voltage detection unit (16) and the current detected by the current detection unit (17);

integration means (22) for generating an integration output obtained by integrating a difference value between the instantaneous power obtained in the calculating means (21) and a predetermined set power (Pset);

means (23, 24) for generating a pulse output having a pulse width corresponding to a difference between a current set value (Iset) formed on the basis

of the integration output and the current (CM) detected by the current detection unit (17);

means (25) for on/off controlling the switching unit (SW1) according to the pulse output from the generating means (23, 24);

means (S1) for stopping the instantaneous power from being supplied to the integration means (22) when the first switch (SW2) is closed in response to the arc discharge; and

means (22, 23, 24) for controlling the current supplied to the sputtering apparatus (18, 19) by on/off controlling the switching unit (SW1) using the pulse output (SWI) generated from the pulse outputting means (23, 24) in accordance with an integration output held in the integration means (22) when the supply of the instantaneous power to the integration means (22) is stopped by the stopping means (S1).

41. A sputtering power supply unit according to claim 40, further comprising a reverse-direction arc prevention circuit (15, R1) connected between one end of the first switch (SW2) and one of the power source terminals of the sputtering apparatus (18, 19).

42. A sputtering power supply unit according to claim 40, wherein the pulse output generating means (23, 24) comprises a comparator (31) having a hysteresis characteristic and configured to compare the current set value (Iset) formed on the basis of the integration output obtained in the integration means (22) and the current (CM) detected in the current detection unit (17), and means (25) for on/off controlling the switching unit (SWI) in response to a comparison output of the comparator (31).

43. A sputtering power supply unit according to claim 40, wherein the pulse output generating means comprises an operational amplifier (61) for performing a calculation,

Iset*L-CM*L+VM*T

wherein Iset denotes the set current value based on the integration output obtained from the integration means (22), CM denotes the current value detected at the current detection unit (17), VM denotes the voltage value detected at the voltage detection unit (16), and L denotes an inductance of the choke coil (L);

a division circuit (62) which divides an output value of the operational amplifier (61) by an output voltage (Vi) of the sputtering DC power source (11); and

a driving circuit (25) for outputting the pulse output in accordance with a division output of the division circuit (62).

44. A sputtering power supply unit according to claim 40, wherein the sputtering DC power source comprises a first rectifier circuit (Do, L0, C1) for rectifying an alternating power source voltage to a DC voltage, a switching circuit (S10, S20) for converting the DC voltage from the first rectifier circuit to a pulse voltage, and a pulse transformer (T1) having a primary coil supplied with the pulse voltage and a secondary coil connected with a second rectifier circuit (B1);

the switching unit comprises a plurality of switching elements (S11, S12, S13, S14) for supplying the DC voltage rectified by the first rectifier circuit to the primary coil of the pulse transformer (T1) as an alternately reversing pulse voltage at a predetermined interval of time as the pulse voltage;

the at least one choke coil is serially connected between one output terminal of the second rectifier circuit (B1) provided at the secondary coil of the pulse transformer (T1) and one of the power source terminals of the sputtering apparatus (18, 19); and

the reverse voltage source comprises an auxiliary rectifier circuit (B2) rectifying an alternating voltage generated at the secondary of the pulse transformer (T1), and a capacitor (C31) connected to be charged with a DC voltage supplied from the auxiliary rectifier circuit (B2).

45. A sputtering power supply unit according to claim 44, wherein the pulse output generating means comprises a sample/hold circuit (63) for sampling/holding a division output from the division circuit (62), a pulse generation circuit (64) for generating the pulse signal having a pulse width corresponding to an output of the sample/hold circuit (63) being supplied to the switching circuit (S10, S20), and a timing circuit (65) for determining a sampling period for the sample/hold circuit (63).

46. A sputtering power supply unit according to claim 44, which further comprises a primary current detection circuit (42) for detecting a current flowing in the primary coil of the pulse transformer (T1), and means (51, 53) for stopping the pulse output from the pulse output generating means (54, 55a, 55b) when a value of the current (CT) is larger than a limit value (CT lim) for preventing magnetic saturation at the pulse transformer (T1).

47. A sputtering power supply unit according to claim 46, which further comprises a CR oscillation circuit (52) supplied with an output from the comparator (31) having the hysteresis characteristic, wherein the switching signal is supplied to the switching unit in accordance with an oscillation output from the CR oscillation circuit (52).

48. A sputtering power supply unit according to claim 43, wherein at least the operational amplifier (61) and the division circuit (62) are composed of a microcomputer (71).

49. A sputtering power supply unit according to claim 45, wherein the division circuit (62) and the sample/hold circuit are composed of a microcomputer (71).